Focus Group Results

Results from Focus Groups in Italy and the Netherlands

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Aim

- To guarantee naive drivers to have a positive experience it is fundamental to know their requirements before designing any product they have to use, especially in automotive domain

- This approach was followed also in the CERBERO project. In particular, we collected final end user (drivers) requirements and used them with the aim to **discover and validate the Smart Travelling use cases and scenarios** which will be implemented into the CRF Virtual Driving Simulator

- This way we are sure that the implemented use cases and scenarios will be the **most relevant for the drivers**

Participants sample recruitment criteria


- **33** participants

- **5** Groups (**5** to **10** participants per group):
  - Group 1: **Hybrid** vehicle owners without charging plug (used for one year at least)
  - Group 2: **Conventional** vehicle owners - diesel or gasoline (used for one year at least or a vehicle no older than 3 years)
  - Group 3: **Electric or hybrid plug-in** vehicle owners (used for one year at least) . Electric/hybrid plug-in or hybrid groups with no segmentation on km/year, compared to the Conventional group with a segmentation on < 10.000 km/year vs. > 20.000 km/year
  - Groups 4 and 5: Mixed **Conventional, Hybrid and Electric vehicle** owners

- **Main criteria for the whole sample**
  - Driver license: 10 years at least
  - Gender: not segmented
  - Age: between 30 and 50 years old
  - Qualification: master degree (preferred)
  - Use of the vehicle: all scenarios (urban, extra-urban, highway)
  - Frequency of use: 5 days a week

Method - Procedure


Focus Group technique was used to identify habit, requirements, needs of end-user and the procedure used was:

Introduction

Opening question

We concentrate on **your travel habits and your travel needs**.
We would like to know from you **what types of trips you make using your car**, **why did you choose to move by car and what kind of positive aspects and negative issues you encounter in making such trips**.

Key question

We give you some **cards that explain the operation of electric and hybrid vehicles**.
Now that you have read the descriptions what are your ideas on those kind of vehicles and the motivation behind your ideas, also respect to gasoline and diesel powertrain?

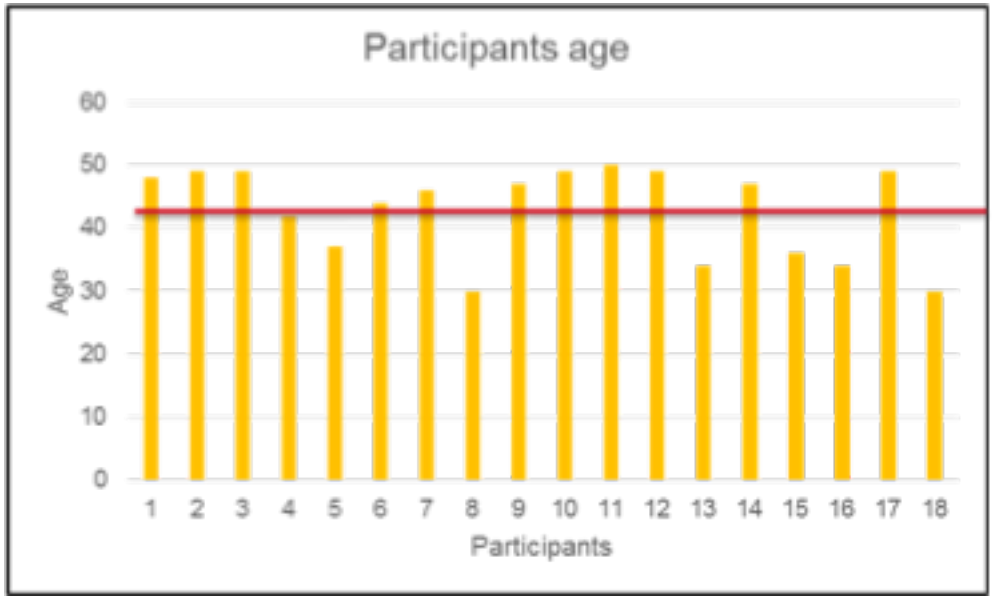
Ending question

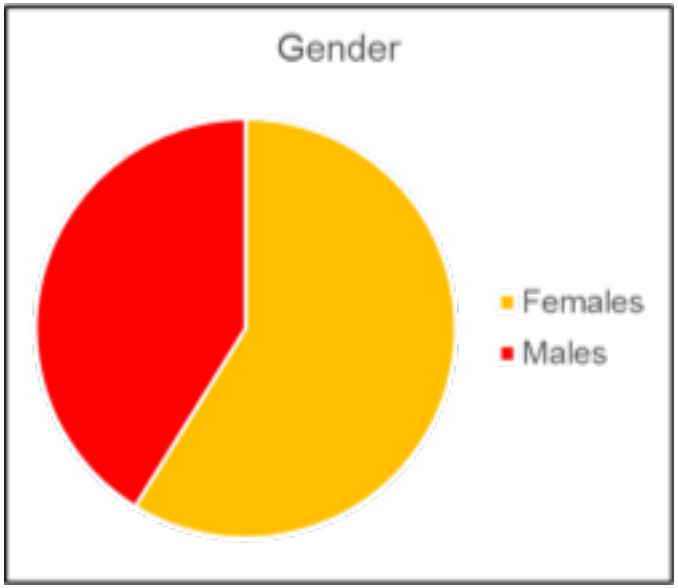
Then we ask you to imagine being the director of a TV commercial. This spot is shot to launch the new range of electric vehicles you tested.
You have decided that the camera will make a very detailed film on all the smaller details of what is going on in the driving scenario, in the interaction between the driver and the electric vehicle and its on board instruments, starting before departure (e.g. when at home, when at work ...), on the way and up to the arrival at the destination.
Describe what is recording your camera, starting from elements that you consider most relevant, followed by all the others elements in order of minor importance. You have 20 minutes ...

Return

Results - Italian sample characteristics - 1

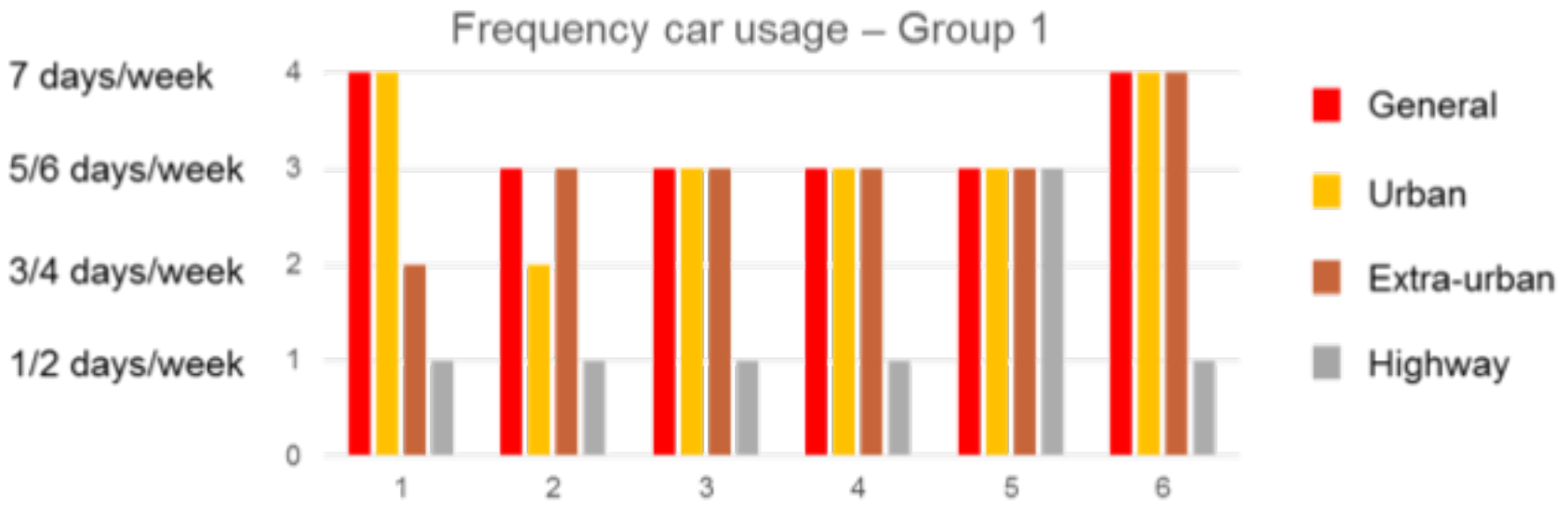
Participants age is from **30** to **49** years old: Media = **42.77** - SD=7.19





Results - Italian sample characteristics - 2

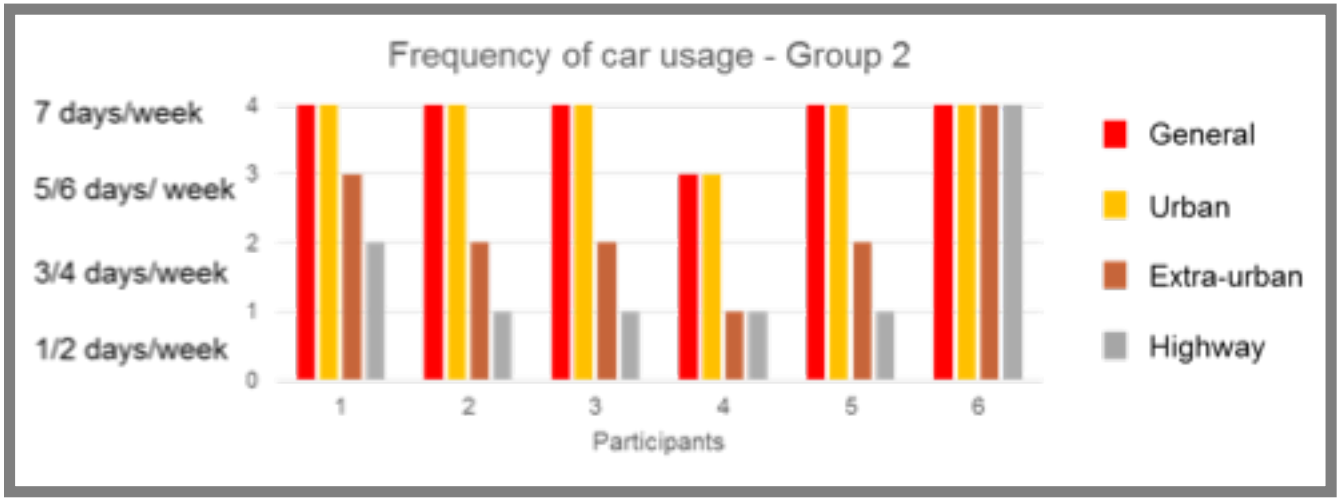
Group 1 - Hybrid vehicles owners

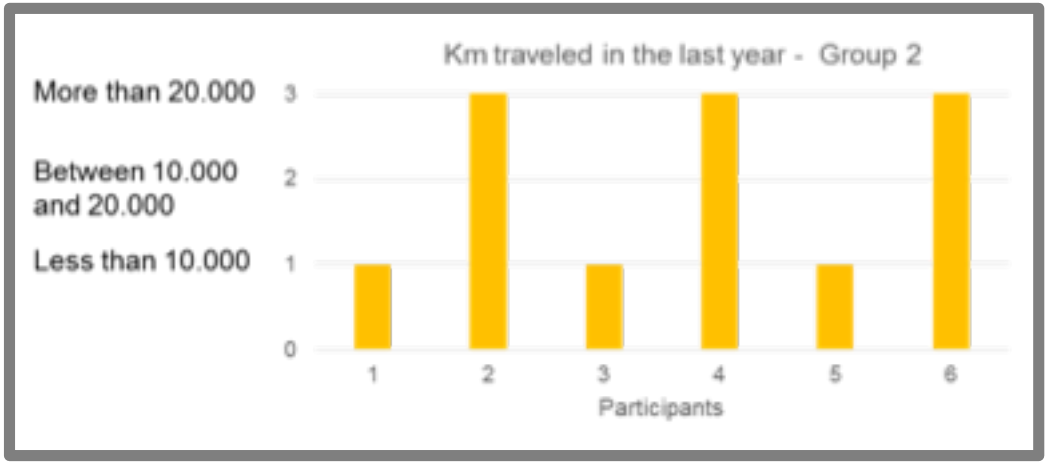


Results - Italian sample characteristics - 3

Group 2 - Conventional vehicles owners

2 participants had diesel vehicles and 4 had gasoline ones

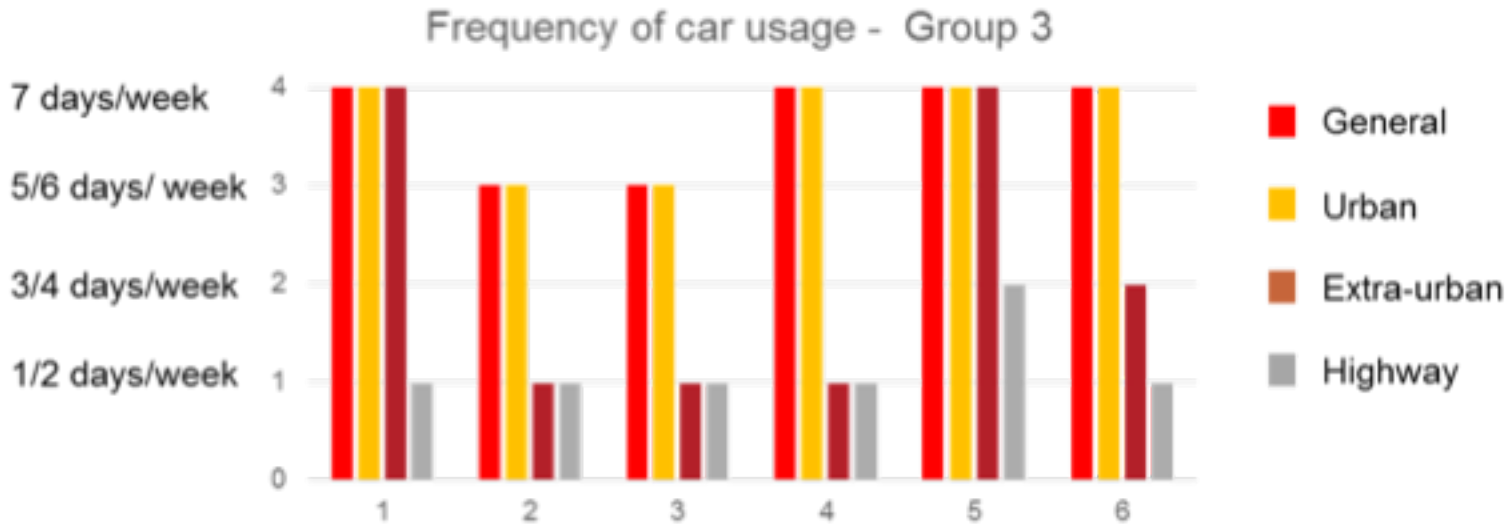




Results - Italian sample characteristics - 4

Group 3 - Electric or hybrid plug-in vehicles owners

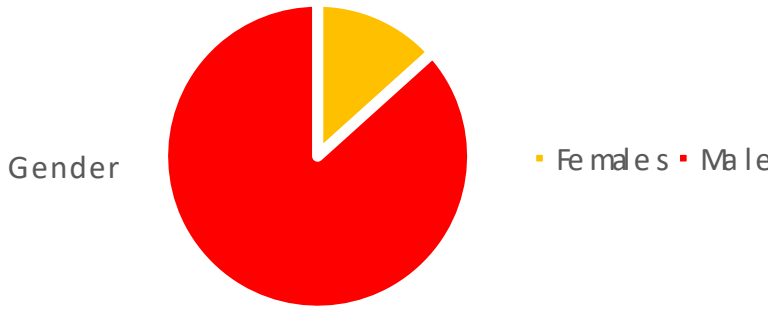
- All electric vehicles owners (5 on 6) have a second car beyond the electric one
- All of them have a garage where they charge their electric or hybrid vehicle



Results - Dutch sample characteristics - 1

Dutch user groups

- Usage of electric and hybrid car is identical to use of conventional car
- Only for travel distances above 200km, a conventional car is still preferred by some drivers
- For very short trips (within the city) the bicycle is preferred above the (electrical) car
- Most drivers with electric car had one or two electric cars, only one driver had both an electric and a petrol car (for long distances)
- Participants would not have bought an electric or hybride car if they would not be able to charge their car at their own house



Results - Dutch sample characteristics - 2

Dutch user groups

- Same usage as normal car (family visits, commuting, traveling long distances for work (200/300 km a day), holidays (also abroad to Spain, France, Germany, Denmark, Italy, Austria), one to two hour trips, groceries, fun/sports/hobbies)
- Used in all weather conditions (rain, winter, summer, rural, urban, hills (during holidays), countryside and on all kinds of roads (highways and other)
- Larger cars (often Tesla) are used more often for long distances (and transporting stuff), while small cars are used more often for short distances (within / near city)
- Comfort is important (e.g. adaptive cruise control, silence, …)
- Only few participants have additional car for long distances
- For longer trips you need to plan charging (charging within the Netherlands is not an issue), including required passes for payment

Results - Italian sample characteristics-6

Owned vehicles

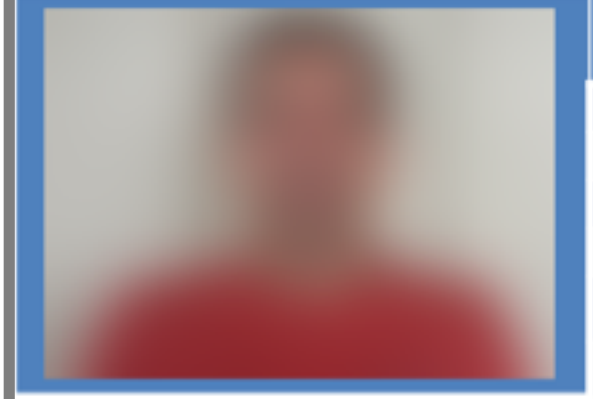
Group	Vehicles brands and models	
Conventional vehicles	RENAULT TWINGO	Gasoline
	NISSAN MICRA	Gasoline
	PEUGEOT 2008	Gasoline
	BMW SERIE 1	Gasoline
	CITROEN C4	Diesel
	NISSAN QASHQAI	Diesel
Hybrid vehicles	TOYOTA AURIS	
	TOYOTA AURIS	
	TOYOTA PRIUS	
	LEXUS NX HYBRID	
	TOYOTA YARIS	
	TOYOTA YARIS	
Electric / Hybrid plug-in vehicles	VOLKSWAGEN GOLF	
	VOLKSWAGEN E-UP	
	VOLKSWAGEN TWIN-UP	
	RENAULT ZOE	
	RENAULT ZOE	
	KIA SOUL	

Results - Dutch sample characteristics-7

Owned vehicles

2 Mixed Groups	Vehicle brands and models
Conventional vehicles	3 x Diesel
	1 x LPG
	2 x Gasoline
Hybrid vehicles	3 x Nissan Leaf
	2 x BMWi3
Electric vehicles	2 x Tesla
	1 x Zero (motor cycle)
	2 x Renault Zoe

Results - Italian Personas - STEFANO



Name	STEFANO
Age	49
Job	IT consultant
Hobby	Scuba diving
Family	Married with son
Vehicle	A segment ELECTRIC
Driving style	Sport, silent, economic

Stefano has an Electric A segment vehicle and he lives with his family in the center of Torino.
Due to his job, every day he moves a lot in the city and its surroundings. When he has to move downtown, he likes to use also public transportation, but when he has to move in the suburban area he has to drive his electric car.

He uses his car only in the city and for short trips. Driving this car, Stefano doesn't pay any parking and he can enter in the limited traffic zones (e.g. downtown). Moreover he has not to pay the proprietary tax on his vehicle.

The battery of his electric car is able to travel for about 200 km. Because of this Stefano looked for a new battery with higher autonomy, but unfortunately the new battery cost too much.
In the weekend he drives from Torino to Genova because he likes scuba diving. When he has to travel medium-long trip, such as from

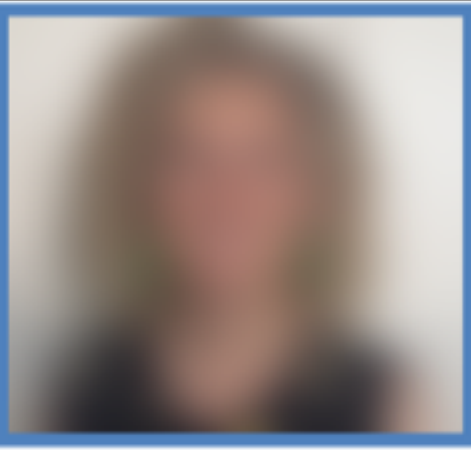
Torino to Genova, he always plans the trip carefully, so to be sure to have the correct battery autonomy to arrive to the destination, and he doesn't change roads.

According to Stefano, driving the electric car is a pleasure because the car is silent and it has an aggressive starting. So in the morning he can be very sporty and in the evening when he is tired his driving is more relaxed thanks also to the silence of the vehicle.
Stefano with his family have a second conventional car. This car is bigger than the electric one. They use the traditional car for long trips.

Stefano and his family have a garage where they put their electric car and where they can charge it. To charge the car, Stefano had to do an energy upgrade of his house energy contract, so his home energy costs are higher than before owing the electric car.

One day, during a trip, Stefano had to change suddenly his way and in that occasion he arrived at home with a very low battery energy. During the trip Stefano turned off the radio, the air conditioning and he closed the car windows in order to save the battery charge as much as possible. Stefano says he didn't panic over the low battery, but he always want to organize his trips to avoid any worry.

Results - Italian Personas - SIMONA



Name	SIMONA
Age	45
Job	Employed in a gym
Hobby	Stay with her sons and read a book
Family	Married with two sons
Vehicle	B segment ELECTRIC
Driving style	Practical, comfortable, economic

Simona describes herself as a “taxi driver” because she spends lot of time driving to carry her sons in different places during the week.

She lives with her family in a little town near Torino in a two-family house, with a little garden and an own garage. Every day she takes the electric car to bring their sons at school and after that she goes at work. In the afternoon she picks up their sons out of school and she take them to do sport activities. After that, she goes to the supermarket and at the end of the day she comes back home. Then she makes many short trips, between Torino and the town where she lives. She travel for about 20 or 30 km per day.

Simona uses the electric car during the week only, because in the weekend she goes with her family to the mountains and in this occasion they prefer to take their second car, a bigger and more adequate for longer trips than the electric one. Even in long travels, when they go to south of Italy, to meet their relatives, they use the conventional car.

Every night Simona charges the electric car in the garage. She has not have any problem with the autonomy of car electrical battery, while driving, because she uses the car only for short distances.

She decided with her family to buy an electric car, because with it they can save money and go in all areas and roads of the city without paying any ticket.

Anyway Simona realized this car is less polluting than conventional ones.

Results - Italian Personas - ANNA

Name	ANNA
Age	34
Job	Mobile merchadising
Hobby	Art, nature, ecologist
Family	Single without sons. She lives alone
Vehicle	C segment HYBRID
Driving style	Relaxed, quiet, careful

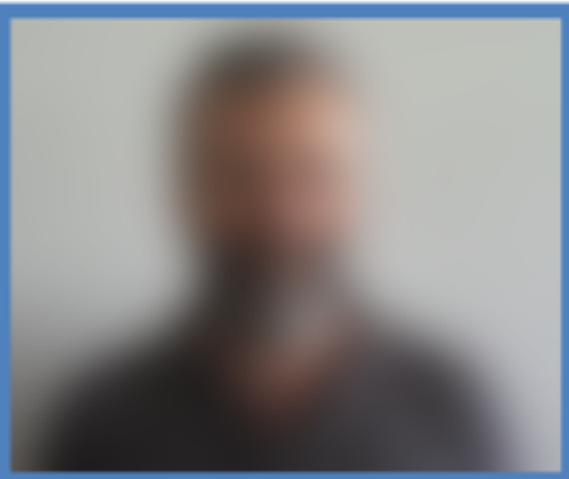
Anna lives in Turin and he usually drives her car every day, in the city and in Turin suburban area for working reasons.

Anna chose to buy an hybrid car because she is an ecologist and to save money too.

She owns only this C segment car, then she uses it not only in the city, but also in highway and for long trips. Anna always has a relaxed driving style, but using this car her driving style become even more relaxed, quiet and careful than before when she drove conventional cars. Through the on-board device she can know when the vehicle is using the electric engine and when it is using the conventional one. Because of this, when she notices she is driving with the traditional engine she slows down to keeps 50km/h and the car switchs to the electric engine. In this way she respects the traffic rules and she doesn't exceed speed limits. Moreover, the car on-board device gives a score on her driving style. Anna likes very much this score, because through it, she is able to understand how much eco is her drive.

With the hybrid car, Anna can drive in restricted traffic areas too and she parks where she wants. Anna doesn't have any problems with the battery charge because the battery charges when Anna is braking and when she is driving down-hilll.

Results - Italian Personas - ANDREA



Name	ANDREA
Age	42
Job	Employed in a gym
Hobby	Winter sport, bike, motorcycle
Family	Cohabitant without sons
Vehicle	B segment HYBRID
Driving style	Sport, agitated, gritty

Andrea lives with his partner in a city near Turin.
They have two cars, the hybrid one and another conventional car.
Andrea often takes the hybrid car because he makes a lot of short trips during the day. He has two different works: he is a medical and he runs a new company. He describes himself as a “driver pirate” because he has a chaotic life and he is always in a hurry and he has a sporty and aggressive driving style.
He chose to buy an hybrid car because he thought that this vehicle type is innovative and original. He likes very much that the car has an aggressive starting. The car battery is always charged because he has a scrappy driving style and he often uses the brake.
In extra-urban roads he doesn’t respect the speed limits but in the city, the electric car helps Andrea to reduce his speed and to observe the city speed limit.
He tried to drive in the mountains with the hybrid car but this car is heavier than a conventional one and. Then he must recognize that mountains are not the ideal environment for his hybrid car

Results - Italian Personas - MAURO

Name	MAURO
Age	33
Job	Aeronautical Engineer
Hobby	Stay with his sons, cooking, tennis
Family	Married with two sons
Vehicle	I segment CONVENTIONAL
Driving style	Relaxed, safe, loose

He drives both for work and during his free time. He travels a lot for his job.
He drives every day in city and on highway because he has to go to company's clients.

He spend lot of time with his children. When he was younger he drove also a motorcycle on track.

He thinks that his car fits for any kind of road and trip.

Results - Dutch Personas - WIM

Name	WIM
Age	48
Job	IT consultant
Hobby	Baseball, Cycling
Family	Single
Vehicle	C segment Electric
Driving style	Economic, relaxed

Wim has bought a second hand electric vehicle. He knows the maximum capacity is considerable lower than when the car was new, but he saved a lot of money on it. Because of the price of battery packs, buying new batteries is not an option.
He wants to be environment friendly and also thinks that this option is the cheapest option for his driving needs (because of low energy cost compared to petrol).
He tries to reduce energy usage on the highway by adapting his driving style (speed) and trying to use al less energy as possible (and sees this as a kind of game).
As there are limited amounts of charging poles at his working location, he tries to arrive as early as possible to ensure he can use the parking place with charging pole (as he needs to change his car in order to get home again).
Wim mainly uses his car for commuting and short trips (as capacity is limited and charging takes considerable amount of time). For longer trips he uses public transport.

Results - Dutch Personas - ANTON

Name	Anton
Age	32
Job	IT consultant
Hobby	Skiing, mountain walking
Family	Married, two children
Vehicle	F segment ELECTRIC
Driving style	Relaxed, economic, sportive

Anton bought an electric car because of the tax discount and he was able to load it at his own house. Important reasons for going electric more than 3 years ago were the silence, comfort and acceleration when driving electric.

Anton uses apps to find charging stations on his way (where app in car is most convenient). What he misses however is up to date info on the availability (occupation) of the charging poles.

He is not worried about empty batteries as there are plenty of charging stations around (and the manufacturer even can make emergency storage capacity available in case of an “empty” battery).

Anton has a relaxed driving style once he is on the highway and reduces speed to save battery power. Because of the fast charging option, time is not considered as an issue when using the car for very long trips (> 200km).

He also takes weather conditions into consideration when he makes a trip (like reduced capacity because of the cold or usage of airco/heater).

Anton uses the car for all trips, similar as he did when he drove a petrol car. He sometimes also uses it for long trips abroad. Only then he needs to plan his trip (the charging) more accurately and ensure that he has the right passes to pay for charging.

Results - Dutch Personas - VERA

Name	VERA
Age	41
Job	Marketeer
Hobby	Walking with dog, sporting in gym
Family	Married, two children
Vehicle	A segment ELECTRIC + C segment ELECTRIC
Driving style	Relaxed, economic

Vera lives in the city.
She owns both a A segment car (which she uses to go to work and for short distances within the city) and an C segment car (which she and her husband use for longer distance trips, when they need to carry stuff e.g. for sports, or go somewhere with the whole family).
Vera drives electric cars to reduce pollution and save the environment.
She has a very relaxed driving style and often adapts her speed to save battery power.

Results - Italian sample - Driving styles

Conventional vehicle group

Hybrid vehicle group

Electric/(Hybrid plug-in) vehicle group

Results - Dutch sample - Driving styles

Conventional vehicle group

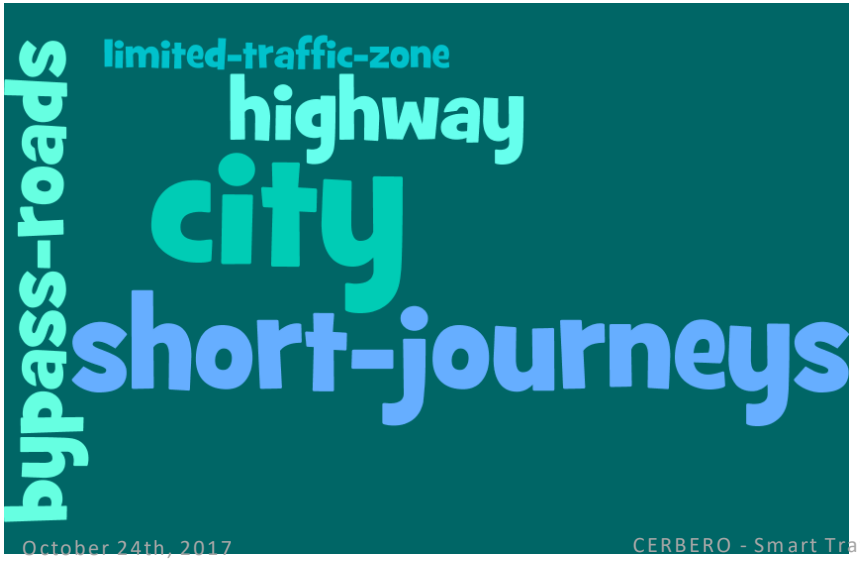
Hybrid vehicle group

Electric/(Hybrid plug-in) vehicle group

Results - Italian sample - Driving scenarios

Conventional vehicle group

Hybrid vehicle group



Electric/Hybrid plug-in vehicle group

Hybrid plug-in

Torino - Genova Fiera roundtrip

Results - Dutch sample - Driving scenarios

Conventional vehicle group

Electric/Hybrid plug-in vehicle group

Hybrid vehicle group

Results - Italian sample - Pros & Cons-1

PROS			CONS		
Hybrid	Plug-in	Electric	Hybrid	Plug-in	Electric
		Brillant starting performance			
Less pollution	Less pollution	Ecology	High consumption with the conventional engine	High consumption with the conventional engine	
Limited traffic zone and free parking	Limited traffic zone and free parking	Limited traffic zone and free parking			
			Small trunk	Small trunk	
Silent	Silent	Silent	Heavy	Heavy	Heavy
		No proprietary tax	Proprietary tax	Proprietary tax	
			Batteries disposal	Batteries disposal	Batteries disposal
No charging problem	No charging problem			Rare charging stations	Rare charging stations
				Charging time	Charging time
	The best if you need just one vehicle	The best if you need two vehicles			Need to buy a second car

Results - Italian sample - Pros & Cons-2

PROS			CONS		
Hybrid	Plug-in	Electric	Hybrid	Plug-in	Electric
	Autonomy respect to hybrid				
			Uphill consumption	Uphill consumption	Uphill consumption
			Uphill performance	Uphill performance	Uphill performance
			Technical trouble shooting	Technical trouble shooting	Technical trouble shooting
		City	**Worries on electric energy production towards pollution**	**Worries on electric energy production towards pollution**	**Worries on electric energy production towards pollution**
	Home charging	Home charging		**Own garage**	**Own garage**
					High home energy consumption
Any trip	Any trip	Organised medium/short trips/ plain			Not long trips
Any slope	Any slope	Slowly going on without stopping on slopes			Low performance uphill
		Less service need	Service to two engines	Service to two engines	

Results - Italian sample - Pros & Cons-3

PROS			CONS		
Hybrid	**Plug-in**	**Electric**	**Hybrid**	**Plug-in**	**Electric**
Little consumption when electric	Little consumption when electric	Little consumption			
			Battery disposal	Battery disposal	Battery disposal
				Power plant ambiental impact	Power plant ambiental impact
				Worries on electric energy production towards pollution	**Worries on electric energy production towards pollution**
				Charging stations broken	Charging stations broken
				Not many kilometers with the electric engine	Short duration of battery charge
			Expensive new battery	Expensive new battery	Expensive new battery
				Higher cost than electric vehicles	High cost
					Fear of battery charge is not enough

Results - Dutch sample - Pros & Cons-1

PROS			CONS		
Hybrid	Plug-in	Electric	Hybrid	Plug-in	Electric
Less gasoline used		Comfort	Heavy compared to traditional car	Charge slow (take up charging space)	Too many charging standards
Good batteries		Silent	In general not sexy	Really need fast-charging option	Price for charging unclear
No gear box & Fast acceleration	No gear box & Fast acceleration	No gear box & Fast acceleration	Added value relatively small		No charging options near home
Available second hand	Available second hand	Having lots of space (small engine)	Technically complex	Hard to get on second hand market	Charging places take up parking space
Reliable	Reliable	Economic (low cost electricity)	Batetries get worse over time	Batetries get worse over time	Batteries get worse over time
Large range	Larger range compared to electric			Hardly sold now because of tax change	50% of elctric bill is taxed
		Additional power (available via service company)			Still difficult for long distances (outside NL)

Results - Dutch sample - Pros & Cons-2

PROS			CONS		
Hybrid	Plug-in	Electric	Hybrid	Plug-in	Electric
	Half tariff (subsedised)	Subsedised	Some people never use electric	Tax (22% for lease cars)	
		Safer (& less speeding tickets)		Information on charging costs not clear / transparent	Information on charging costs not clear / transparent
		No fumes/smells		More charging station needed in some areas	More charging station needed in some areas
		Less maintenance	Same (or more) maintenance as traditional car	Same (or more) maintenance as traditional car	
		Good infrastructure and accurate info (Tesla app)	Range indication in most cars is not very accurate	Range indication in most cars is not very accurate and range extenders are not very well integrated	Range indication in most cars is not very accurate

Results - Users' hints for next future


- The electric vehicle can move in any road and setting:
  city, historical town, hill, mountain, desert, plain, highway, extra-urban road
- The electric vehicle can be used in any kind of trip - long and short ones
- The car speaks and has a conversation with its «driver»/passengers
- It has autonomous driving and can follow speed limits and traffic rules in an autonomous way
- During the trip, the vehicle avoids the traffic
- The vehicle is able to choose the best way to go in a place
- Vehicles are shared and they recognised new «drivers»/passengers who enter in
- At home, the vehicle puts itself (in autonomous way) on charging
- It can travel thousand of kilometers and it can charged in some minutes
- Mobility as a service (order car only when needed / on demand)
- Car is automatically charged by equipment in the road, in parking places or via solar panels on the car
- The car will become an integral part of your life and anticipates (like a personal assistant it will know your transportation needs and acts accordingly)
- It interacts with driver through video and speech and can provide additional services (like ordering meals)
- The car battery can be used as energy source for energy storage in the house

Results - Use cases & Scenarios - 1

Urban trip

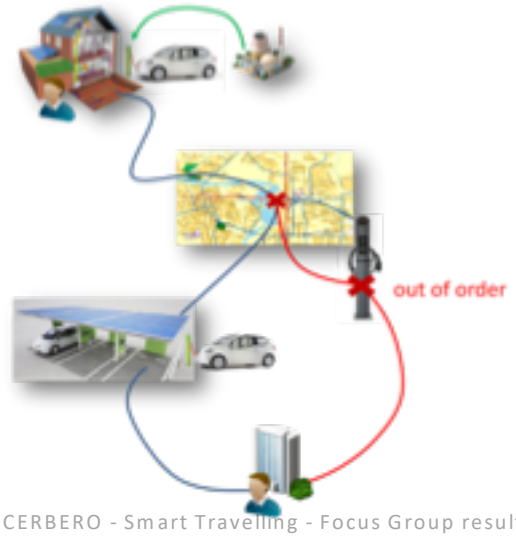
- Issue: **problems with battery charge can arise if a rerouting is needed for some reasons**:
  - sudden congestion
  - unforeseen event (e.g. sudden family committment, scheduled agenda change…)

- Recovery scenario: switch off on-board devices (e.g. air-conditioning, radio…)

Results - Use cases & Scenarios - 2

Highway trip

- Issue: **problems with battery charge during the trip** if:
  - there are no charging station at a regular distance
  - the planned charging station is out of order
  - the charging time is long and slow (need to do longer stops during the journey than the scheduled ones)
- Recovery scenario: plan the trip very carefully before starting

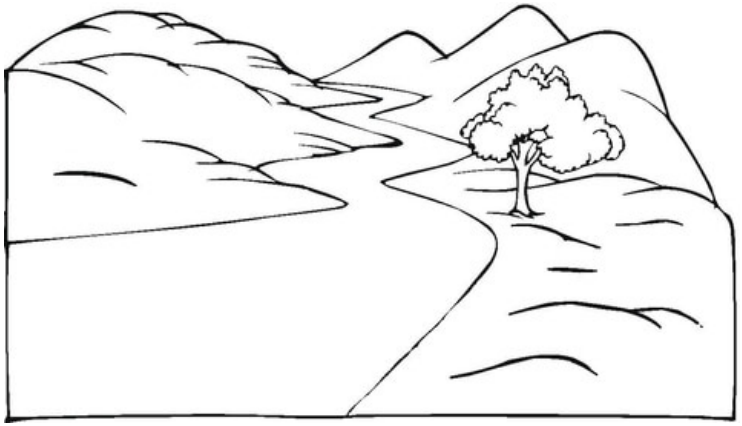


Results - Use cases & Scenarios - 3

Up-hill trip

- Issue: **problems with enough vehicle power to climb and to climb in a safe way with the current battery charge**

- Recovery scenario: plan the trip very carefully before starting



Conclusions

- The results from the Focus Group activities gave the following positive input to CERBERO project:
  - Deepening **real drivers' way** of **using electric/hybrid vehicles**
  - Highlighting **concrete issues and worries during drivers' usual trips**
  - Finding out **hints on new vehicles**

- Even if the CERBERO projects final users are engineers and not naive drivers, it is important to design tools in the CERBERO toolchain that can be applied on **use cases and scenarios which are based on real naive users needs**

- This way the final tests will have **valid outcomes**, because tested on **use cases relevant for the drivers/passengers**, who are the **final end users in travelling scenarios**

Conclusions on country differences - 1

- The drivers from the Netherlands are **less worried about charging** than Italian drivers (mainly caused by the fact the Netherlands has a much better charging infrastructure).
- Drivers from the Netherlands owing large electric cars (Tesla and BMWi3) also use their cars for **long distance trips** (e.g. going abroad) while drivers with smaller cars and all Italian drivers only use their electric cars for short trips (inside the city).
- **Adoption** of electric and hybrid plug-in cars seems to be much bigger in the Netherlands than in Italy. Most participants already owned an electric or hybrid plug-in for several years. This difference could have been caused the better charging infrastructure and taxation rules in the Netherlands but also by the fact that many participants had links with electric car business (and thus are early adaptors).
- **Road impact** like uphill driving is not an issue for most Dutch drivers (who do not go abroad with their electrical car).

Conclusions on country differences - 2

- **Environmental savings** in Italy are perceived to be small because of indirect environmental impact via power plants (according to participants ("*Worries on electric energy production towards pollution"*), as opposed to the Netherlands, where participants did perceive environmental saving when driving an electrical vehicle (possibly because of the familiarity with "green" energy production in the Netherlands).
- In the Netherlands the **bicycle** is an important alternative for the car for short trips, where in some cities in Italy the bicycle is less popular and an electric car could be a preferred option.